

• COLORADO RIVER •
AQUEDUCT NEWS

THE METROPOLITAN WATER DISTRICT

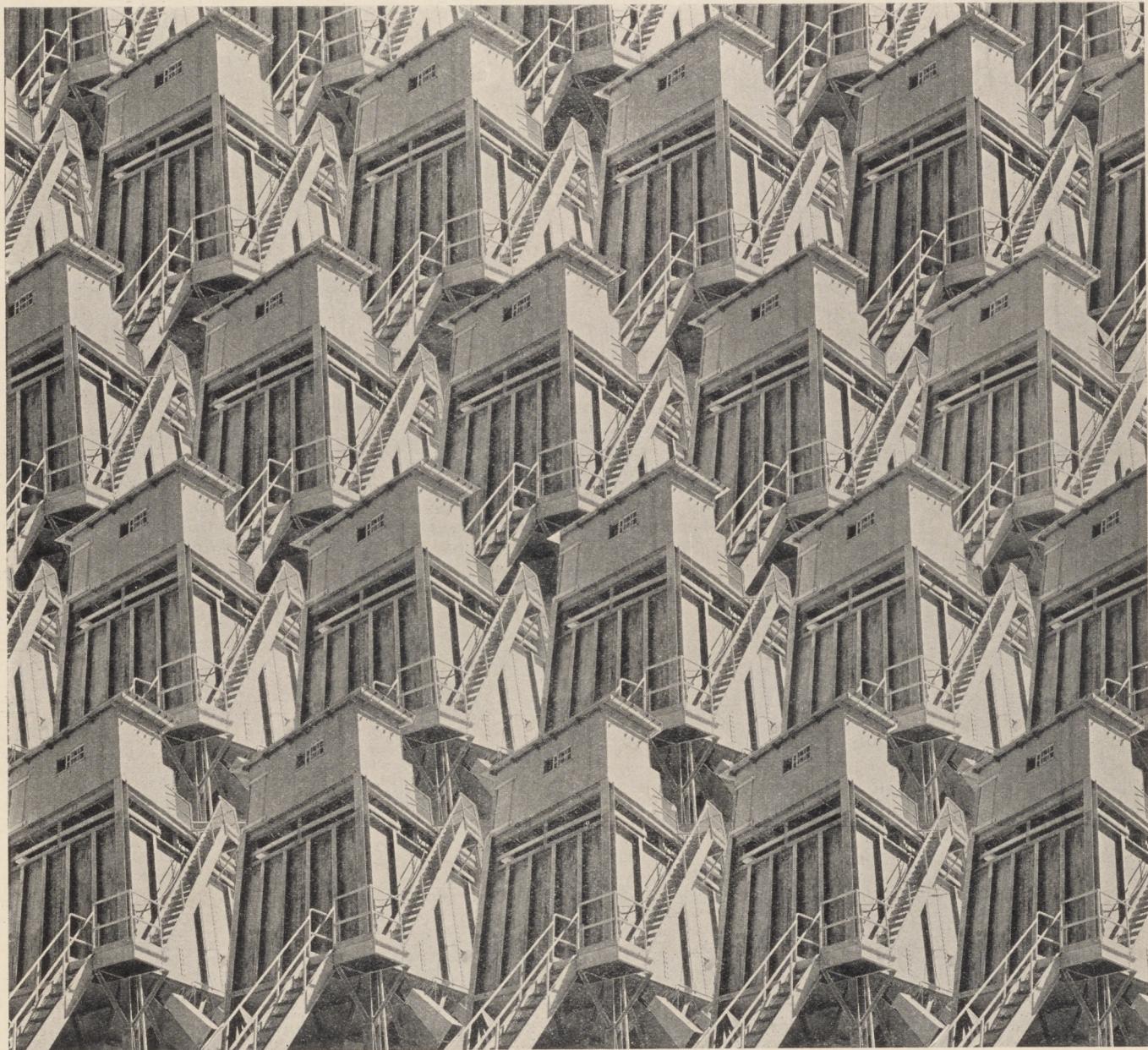


OF SOUTHERN CALIFORNIA

Vol. V

SEPTEMBER 10, 1938

No. 17



Not modernistic cliff dwellings—but a multi-view of the East Portal batching plant of the San Jacinto tunnel, as put together by District Photographer Will Fox.

COLORADO RIVER
AQUEDUCT NEWS
 THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

306 WEST THIRD ST.
 LOS ANGELES, CALIFORNIA

*Published twice monthly in the interest
 of Field and Office Workers on the Colorado
 River Aqueduct, and for the information
 of all other citizens of the Metropolitan
 Water District.*

Vol. 5 September 10, 1938 No. 17

Bids Called for On Extension of Palos Verdes Line

Adding another fourteen miles to the 322 miles of the Colorado River Aqueduct which are already completed or under construction, work will soon be started on the lower half of the Palos Verdes feeder of the aqueduct distributing system.

Notices are being sent out on September 13 inviting bids on District specifications No. 283 covering approximately 13.5 miles of pipe lines for this part of the distribution system. The proposed work will be divided into two schedules, No. 24 being 6.8 miles in length, and No. 25 being 6.7 miles long.

Extending in a southerly direction from 98th and Wadsworth Streets in Los Angeles to Narbonne Avenue and Palos Verdes Drive in the Palos Verdes Hills, the new line will carry water to be delivered to Torrance, Compton, Long Beach and the Los Angeles harbor area.

Bids are being called for on alternative types of construction. The two types, which are referred to as "P" and "SC", call for lock-joint steel cylinder reinforced precast concrete pipe; and welded steel-plate pipe with gunite exterior coating and centrifugally applied (spun) mortar lining, respectively.

In both types of construction, the inside finished diameter of the pipe line will be 50 inches. Approximate trench excavation will be in excess of 200,000 cubic yards of material. Other bidding quantities vary depending upon the type of construction. The "SC" type of construction is the same as is now being constructed on the northern part of the Palos Verdes lateral.

Bids for the 13.5 miles of work are to be opened on October 4, 1938, and
(Continued on Page 5)



Location of the extension of the Palos Verdes feeder, bids for which will be opened on October 4, is shown on this map. The new schedules (Nos. 24 and 25) connect with the existing line at 98th street in Los Angeles.

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Schedules 8C, 9C, 12C, Basich Bros., Nick Basich, Gen. Supt.
 Schedules 21SC, 22SC, 23SC, J. F. Shea Co., Gilbert J. Shea, Gen. Mgr.; C. A. Shea, Jr., H. F. Rennebohm, Supts.

Distribution Headworks, The Contracting Engineers Co.; Julian Huddleston, Supt.

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Distribution Tunnels
 Monrovia Tunnels Nos. 1, 2 and 3, West Construction Co., H. E. Carleton, Gen. Supt.; E. M. Penn, Concrete Supt.

Distribution Pipe Line
 Schedules 9P, 10P, 11P, United Concrete Pipe Corp., John Huber, Plant Supt.; Roy Richards, Construction Supt.

Schedules 8C, 9C, 12C, Basich Bros., Nick Basich, Gen. Supt.
 Schedules 21SC, 22SC, 23SC, J. F. Shea Co., Gilbert J. Shea, Gen. Mgr.; C. A. Shea, Jr., H. F. Rennebohm, Supts.

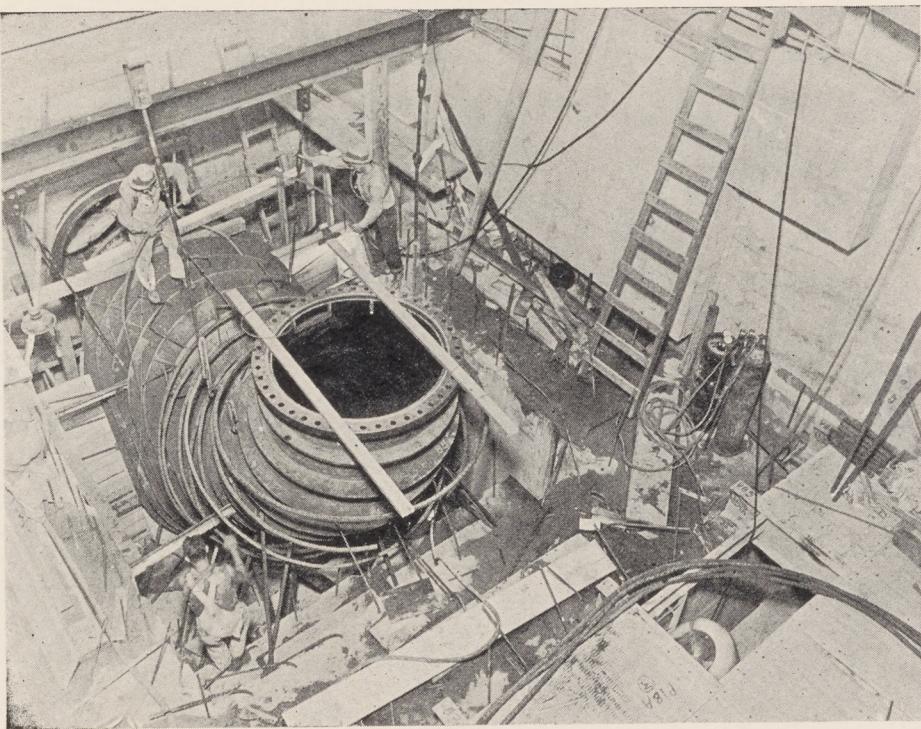
Distribution Headworks, The Contracting Engineers Co.; Julian Huddleston, Supt.

(Dams)

Parker Dam, J. F. Shea Co., Frank Crowe, Gen. Supt.; H. P. Bunker, Constr. Eng., U.S.B.R.

SUPERINTENDENTS OF CONSTRUCTION

Intake and Gene.....T. T. Walsh
 Iron Mt.B. H. Martin
 Eagle Mt. and Hayfield.....R. C. Booth



District force-account crew installing the inlet elbow for one of the pumps at the Hayfield pumping plant.

1251 Ft. Excavated In San Jacinto During August

Turning in another excellent progress report for the month of August, the San Jacinto hard-rock crews excavated a total of 1,251 feet between the Lawrence adit and the Potrero shaft during that month. This ranks as one of the best two-heading monthly progress reports that has been turned in on the 13-mile tunnel.

Averaging 20.3 feet per day, the Potrero heading was advanced 630 feet during August, while the Lawrence West face was pushed 621 feet for a daily average of 20 feet. Improving rock conditions made it possible to double the rate of progress during the last half of the month as compared with the first part of the period.

Total progress for the first half was 437 feet and from August 16 to 31, inclusive, the progress was 804 feet. On September 10 the total footage remaining to be excavated in the San Jacinto tunnel had been reduced to 3149 feet.

On September 10 the progress tables also indicated that 54 per cent of the concrete lining in the tunnel had been placed. Continuous concreting work is being carried on in both sides of the tunnel from plants located at the East and West portals.

Concrete curb is now being placed east from Lawrence adit toward the completed lined section paralleling the Cabazon pioneer tunnel. At the present time approximately 20,232 feet of lining remains to be placed east of the Lawrence adit.

Veterans Form Large Part of Army of Aqueduct Workers

With the National Convention of the American Legion scheduled to bring ex-service men from all over the nation to Los Angeles during the week of September 19, it is interesting to note the large part that the veterans have played in the construction of the Colorado River Aqueduct.

George P. Dykes, manager of the Central Employment Bureau for Veterans, in a letter to General Manager F. E. Weymouth on September 1, 1938, stated:

"With the completion of 85 per cent of the Colorado River Aqueduct, and the practical ending of heavy employment on that project, I wish to express the appreciation of the veterans of the District for the whole-hearted cooperation your organization has extended this Bureau in the placing of veterans in employment.

"A careful compilation of employment figures reveals that during the past five and one-half years of construction, the District has placed in employment over 14,000 veterans, approximately 40 per cent of the total number engaged.

(Continued on Page 5)



Will Fox takes his motion picture outfit for a ride through the San Jacinto tunnel. The motorman is R. S. Hudson, and looking for the birdie in the camera, lower left, is Harry Carmody of the L. A. Garage.

CONSTRUCTION PROGRESS

August 16 to 31, 1938

SUMMARY

TUNNEL (MILES)	EXCAVATION		LINING		CANAL, CONDUIT AND SIPHON (MILES)		DISTRIBUTION PIPE LINE (MILES)			
	Completed	Remaining	Completed	Remaining	Excavation	Completed	Remaining	Excavation	Completed	Remaining
Aqueduct	91.44	0.67	86.06	6.05		145.60	0.01		56.38	6.82
Distribution	16.30	0.37	16.21	0.42	Concrete	144.42	0.14	Concrete	56.06	7.14
Total	107.74	1.04	102.27	6.47	Backfill	80.70	0.14	Backfill	54.49	8.71

TUNNELS AQUEDUCT

CONTRACTOR	TUNNEL	LENGTH IN FEET	EXCAVATION IN FEET					LINING IN FEET					
			NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING	ARCH OR INVERT	NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA	SAN JACINTO Cabazon Shaft to East Portal	8,880			Completed	8,880	0	Arch	0	0	(193)	(36,898) (31,945)	
	Cabazon to Lawrence	26,809			Completed	24,158		Invert	0	0	0	8,484 396	
	Lawrence to Cabazon				Completed	2,651	0	Arch	0	0	0	6,973 19,836	
	Lawrence to Potrero		48	8.1	391	2,383	0	Invert	0	0	0	6,972 19,837	
	Potrero to Lawrence	17,672	48	8.6	413	11,773	3,516	Arch	—	—	121	5,802 11,870	
	Potrero Shaft to West Portal	15,482			Completed	15,482	0	Invert	4	119.8	479	6,591 11,081	
	TOTALS	Ft. Miles.	68,843 (13.04)	96	8.4	804 (0.15)	65,327 (12.37)	3,516 (0.67)	Arch	—	—	121	36,741 32,102
								Invert	4	119.8	479	37,529 31,314	

DISTRIBUTION

*Invert considered to equal 0.2 and arch 0.8 of completed section.

WEST CONSTRUCTION CO.	MONROVIA NO. 3	32,105		Completed	32,105	0					0	32,095	0
J. F. SHEA CO., INC.	ROCKDALE (Schedule 21SC) OAKHILL (Schedule 21SC) ASCOT (Schedule 21SC)	262 597 1,622	46	6.1	0 281 0	262 281 1,622	0 316 —				0 0 0	262 597 1,622	
	TOTALS	Ft. Miles.	34,586 (6.55)	46	6.1	281 (0.05)	32,648 (6.18)	1,938 (0.37)				0 0	32,357 (6.13) 2,219 (0.42)

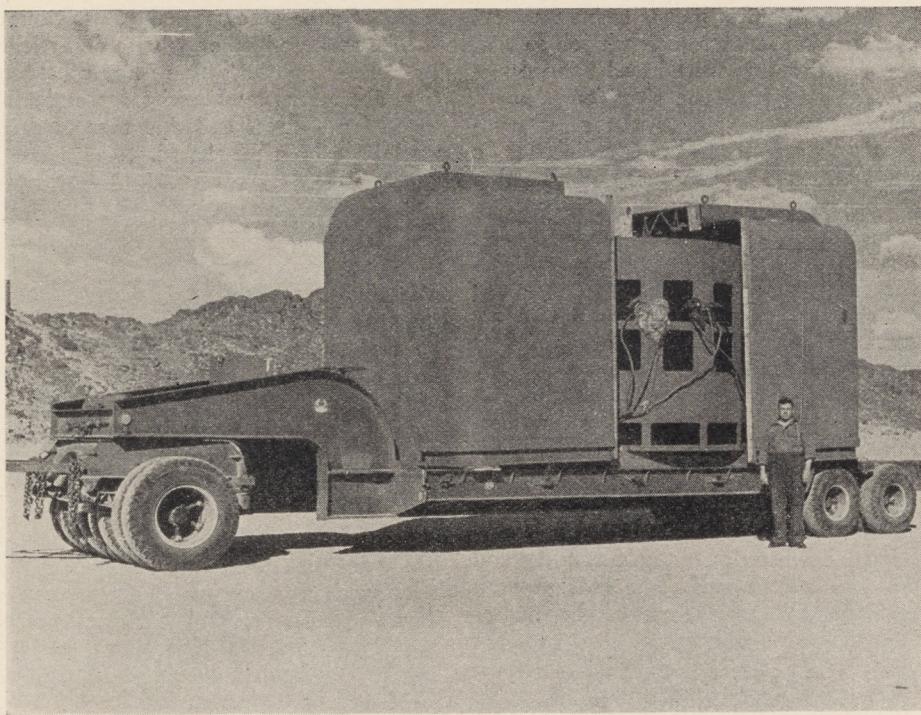
Canal, Conduit, Siphon and Pipe Lines

AQUEDUCT

SCHED. NO.	CONTRACTOR	FEATURES	Length In Feet	EXCAVATION—Feet			CONCRETE—Feet			BACKFILL—Feet		
				Period	To Date	Remain'g	Period	To Date	Remain'g	Period	To Date	Remain'g
20 A & B	M. W. D.—FORCE ACCT.	Siphon	752	0	705	47	0	0	752	0	0	752
DISTRIBUTION PIPE LINES												
9-P	UNITED CONC. PIPE CORP.	Precast Concrete Pipe	8,697	0	8,697	0	0	8,697	0	525	8,697	0
8C-9C-12C	BASICH BROTHERS	Cast-in-Place Conc. Pipe	1,656	0	1,398	258	0	1,148	508	74	1,014	642
21SC	J. F. SHEA CO., Inc	Welded Steel Pipe	26,449	2,748	17,454	8,995	1,773	16,338	10,111	750	10,215	16,234
22SC			28,310	1,553	1,553	26,757	1,213	1,213	27,097	0	0	28,310
23SC			34,358	586	34,358	0	766	34,358	0	1,895	33,580	778
	TOTALS		99,470	4,887	63,460	36,010	3,752	61,754	37,716	3,244	53,506	45,964

Miscellaneous Construction

PARKER RESERVOIR—SIX COMPANIES, INC.					AQUEDUCT PUMPING PLANTS AND APPURTENANT WORKS					
FEATURES		Est. Quan.	Period	To Date	Per Cent.	PLANT	CONTRACTOR	PER CENT COMPLETED		
								CONSTRUCTION	Installation of Equipment	
Diversion Tunnels—Excav.		3,463 Ft.	0	3,463	100	INTAKE	WINSTON BROS. CO. & WILLIAM C. CROWELL	100	(Force Account)	
Diversion Tunnels—Concrete		3,363 Ft.	0	3,363	100	GENE		100	90	
Cofferdams—Excav.		227,582 C.Y.	0	227,582	100	IRON MT.	WOOD & BEVANDA	100	85	
Cofferdams—Fill		464,890 C.Y.	0	464,890	100	EAGLE MT.	L. E. DIXON CO.	100	92	
Outlet Works—Excav.		220,000 C.Y.	0	207,787	100	HAYFIELD	L. E. DIXON & CASE CONST. CO.	100	75	
Outlet Works—Concrete		5,000 C.Y.	0	5,600	100				40	
Dam—Excavation		1,502,200 C.Y.	0	1,526,726	100					
Dam—Concrete		297,900 C.Y.	0	290,667	100					
Power House—Excav.		58,000 C.Y.	0	67,894	100					
Power House—Concrete		14,000 C.Y.	0	15,431	100					



Loading the trailer to its full capacity, this is a part of one of the electric motors for the Eagle Mt. pumping plant.

Additional Work To Be Started

(Continued from Page 2)

the specifications provide that the work must be completed in the latter part of next year.

As shown on the map, the new work will extend the distributing feeder from the southern end of Schedule 23SC to a point in the Palos Verdes Hills near which the District will construct a reservoir with a capacity of 1000 acre feet of water.

Specifications are now being prepared for this Palos Verdes reservoir and bids are expected to be called for in the near future for the construction of the structure which will serve as a regulating reservoir and will also provide emergency water supplies for areas in the southwestern part of the District.

The District's Board of Directors recently approved purchase of a site for this reservoir which is immediately south of the intersection of Narbonne Avenue and Palos Verdes Drive. With its capacity of approximately 325,000,000 gallons of water, the structure will be of the cut-and-fill type.

Approximate quantities for the structure include 1,600,000 cubic yards of excavation, and 1,000,000 cubic yards of compacted fill. The reservoir will be lined with reinforced gunite, and access to the structure will be through a 750-foot tunnel.

Specifications are also being prepared at the present for the laterals which will connect the cities of Torrance, Compton, and Long Beach with the Palos Verdes feeder, and bids will be called for soon for this additional construction work.

RECORDS INDICATE MORE THAN 40 PER CENT OF ALL AQUEDUCKERS ARE EX-SERVICE MEN

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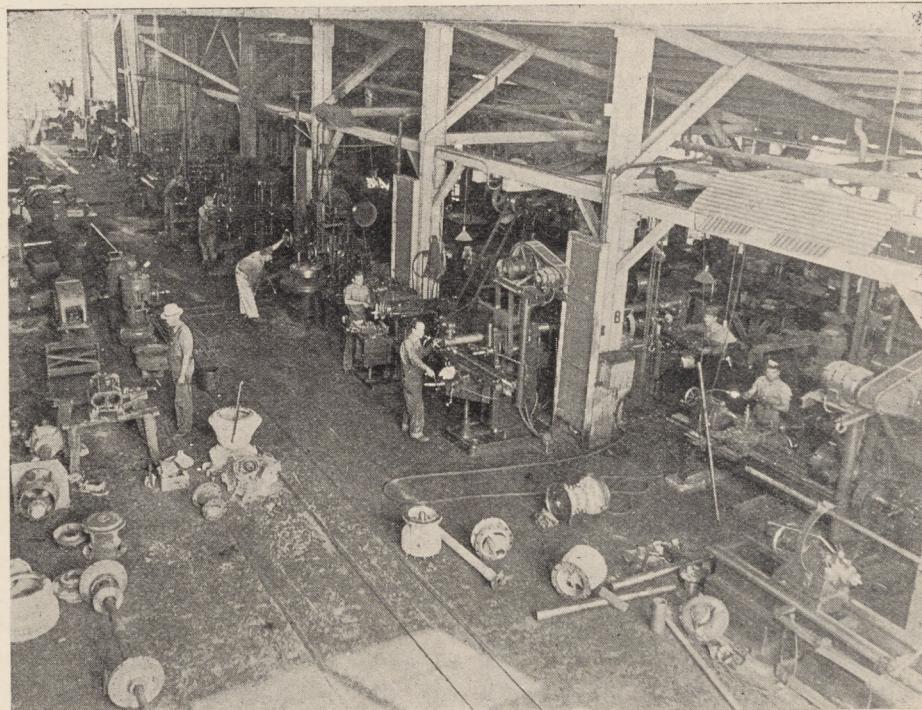
"We seriously doubt if any organization in the United States can approach this record.

"Particularly gratifying is the attitude taken by the District in respect to age limits. Your District at all times maintained that men between the ages of forty and fifty were capable of performing the duties required, and at no time were we forced to be reticent in sending you men of that age level.

"Many veterans who would have been forced to a rather precarious living were enabled to make a splendid living for themselves and families, and at the same time establish rather comfortable savings accounts.

"Veterans working on the aqueduct were given every advantage possible, and practically every one who showed initiative was rewarded. We have records of men going out as common laborers who rose to such positions as foremen and superintendents."

Compilation of records in the District's employment office, which is under the direction of Col. N. F. Jamieson, and the records of the Veterans Bureau indicate that the peak year for employment of ex-service men was in 1935 when 3,883 were employed.



An interior view of the District shop at Banning which handles all mechanical work for the construction of the San Jacinto tunnel.

Specifications

Their Preparation, the Problems Involved, and the Results Obtained.

By C. A. BISSELL
Office Engineer, M. W. D.

The first call for bids on permanent construction work in connection with the Colorado River Aqueduct was for the construction of the San Jacinto tunnel. The form developed for this set of specifications established a pattern which has been followed more or less closely in all subsequent construction specifications issued by the District. "The contract" is defined in the specifications as consisting of the Notice Inviting Bids, Instructions to Bidders, Proposal, Agreement, Specifications, and Drawings. These documents, together with the bond forms, are bound up into a single volume and issued to prospective bidders.

The burden of knowledge of and compliance with all applicable local, state, and federal laws and regulations rests of course with the contractor, regardless of specification provisions. Certain legislative enactments however are required by state law to be specifically set forth in the specifications, including those relating to the eight-hour law, prevailing rate of per diem wages, and prohibition of employment of alien labor. The Reconstruction Finance Corporation requires the inclusion of provisions relating to prohibition of employment of convict labor, use of domestic materials and machinery, regulations regarding rates of pay for labor, employment preference to ex-service men and, west of Cajalco, the 30-hour (now 40-hour) week. In accordance with action by the District's board of directors' provisions are included requiring the contractor to give preference in employment to residents of the District, where they are qualified. In order to protect local surety company agents and brokers, attention is called in the Instructions to Bidders to the state law requiring premiums on risks located within the state to be paid to and credited to offices located in the state.

Following San Jacinto, specifications for other tunnels were issued in rapid succession, until by June 16, 1933, the construction of all main-aqueduct tunnels had been provided for, except East Eagle, bids on which had been rejected, and Schedules 7 and 8 of the West Coachellas which were later authorized for force-account construction. The writing of this group of specifications was preceded by months of preparatory work. In addition to the location surveys and geological reports, District engineers experienced in tunnel work made

complete designs, plans, estimates, and construction layouts for each job so that the specifications were based upon definite knowledge of the situation at each tunnel, as complete as the most competent contractor would collect as a basis for his bid. Subsequent construction specifications received equally thorough study. As a further guide in the comparison of bids and award of contract thereunder, regulations require that a sealed copy of the Engineer's estimate be filed with the Board in each case prior to opening bids.

Plans and specifications for the San Jacinto tunnel called for a 16-foot-diameter full-capacity bore. The specifications for Valverde and Bernasconi and for the Iron Mountain-Coxcomb-Cottonwood group were issued with alternative schedules for half-capacity and full-capacity tunnels. The bids in both cases showed that the cost of the smaller tunnels would be more than 80 per cent of the cost of the larger, so all tunnels were constructed full size.

All conduit, canal, and siphon schedules east of the Coachella tunnels, comprising 110.62 miles of open work, were included in Specifications No. 70, issued in August, 1934. Contract awards under these specifications aggregated \$14,166,000. The remaining 30.5 miles of main aqueduct open work was advertised in October of the same year, followed in rapid succession by specifications for the distribution system tunnels, the Boulder Dam transmission line, Cajalco dam and dike, and the upper feeder pipe lines. Intake and Gene pumping plants were advertised together as a single job in October, 1935; the other three pumping plants one after the other during the following nine months. Specifications for the Monrovia, San Gabriel, and Eagle Rock canyon crossings and the Gene Wash and Copper Basin dams were issued during the winter of 1936-37, and bids on the Palos Verdes feeder were opened September 1 of the latter year.

Ordinary purchases of standard articles of commerce are taken care of by the purchasing division, but where deliveries are to be made over an extended period, where the estimated cost is in excess of \$10,000, or where the materials or equipment are of a special nature, formal specifications are prepared. Under such specifications there have been delivered to date 6,800,000 barrels of portland cement, 70,000 tons of reinforcement steel, 695 miles of steel reinforced aluminum cable, pumps, motors, and electrical equipment for the five pumping plants aggregating more than \$3,500,000 in cost, and hundreds of

items of slide gates, radial gates, valves, steel forms, and other fabricated articles too numerous to mention. For construction operations by District forces 5,000 tons of explosives and 300 tons of drill steel have been purchased.

In the preparation of specifications for materials, the standards of the American Society for Testing Materials, Federal Specifications Board, A.P.I.-A.S.M.E. Welding Code, and other recognized authorities, wherever applicable, are incorporated in District specifications by reference. Constant contact is maintained with manufacturers and excellent cooperation has been given by them in the preparation of specifications relating to their respective specialties. Research by District engineers has developed new or improved specifications for a number of products, such as sealing compound and whitewash for curing concrete under desert conditions, and coal-tar enamel and primer for steel pipe. The District's experimental work in cooperation with the California Institute of Technology, the results of which are incorporated in Specifications 116 for 200-c.f.s. pumps for the aqueduct pumping plants, has been described elsewhere.

An extensive investigation of California portland cements carried on at the Banning laboratory by the District's testing engineer in cooperation with the cement companies and the University of California resulted in the preparation of specifications for five different types of cement for District use, each differing in greater or lesser degree from the then current A.S.T.M. standard and each especially adapted to definite requirements of some part of the aqueduct work. For the bulk of the work 6,000,000 barrels were manufactured under the District's Specifications No. 79, which call for a cement meeting in general the requirements of a standard portland but somewhat more finely ground and more closely restricted as to allowable percentages of the less desirable compounds. The other cement specifications include sulphate-resistant cement for use where soil samples indicate that corrosive ground waters will be encountered, high early strength cement for temporary gunite support in tunnels and for grouting to cut off water ahead of tunnel excavation, low-heat cement for mass concrete in dams, and a portland-pozzuolan cement for a short test section of tunnel lining.

Up to May 16, 1938, a total of 281 major specifications had been issued. These have resulted in 403 formal contracts, involving a total expenditure of \$106,840,000.

NEWS FROM FIELD AND OFFICE



A good-bye picture of Dick Stephens, office engineer at Banning Headquarters, who ended 15 years of service on the aqueduct on September 3, when he resigned to take a position in Texas.

Richard "Dick" Stephens, the oldest (in point of service) old-timer on the job, resigned from the District on September 3, to accept an engineering position with the International Boundary Survey, his headquarters to be in El Paso, Texas.

Dick, who was born in Arizona in 1902, has very nearly grown up on the Colorado River Aqueduct project. He first went to work on the job as a topographic draftsman at Beaumont in March, 1923, for the Water Department of the City of Los Angeles. He left the job for a short period in that year to return to the University of Arizona to get his engineering degree, and then returned to work on the aqueduct preliminary surveys. Since 1934 he has been office engineer at the District's Field Headquarters in Banning.

His new position will be in connection with construction work being carried on by the International Boundary Survey in straightening the Rio Grande River and diverting its waters for irrigation purposes.

Dick is known by nearly every man who has had any connection with the location and construction of the main aqueduct, and his many friends unite in wishing him the greatest of luck at his new post.

Aqueduct Temperatures

August 16 to 30, 1938

	Max.	Min.
Div. 1	113°	71°
Div. 2	112°	70°
Div. 3	110°	68°
Div. 5	101°	52°

O. T. "Tom" Helpling, formerly traffic manager in the purchasing division, has resigned from the District to become commercial agent for the Empire Freight Company, with offices in Los Angeles.



A familiar oldtimer on the job is H. J. Whiteman, custodian of the Banning Headquarters building. He started on the aqueduct as bull-cook at Division 1 in 1933, and has been at Banning since January, 1937.

Another name for the old-timer's list is that of Al Preston, foreman of the Banning garage. Al has been on the aqueduct project since 1927 and has been responsible for keeping automotive equipment rolling across the desert since that time.

* * *

An interesting note in the Los Angeles Evening Herald and Express column "50 Years Ago Today" states: "A. S. Joseph, who left Los Angeles last May (1888) for a trip through the east and to London to see his mother,

whom he had not seen for 30 years, has returned to this city. His mother presented him with a diamond ring that had been in the family for 100 years." A. S. Joseph was the father of Saul Joseph, M. W. D. purchasing agent.

* * *

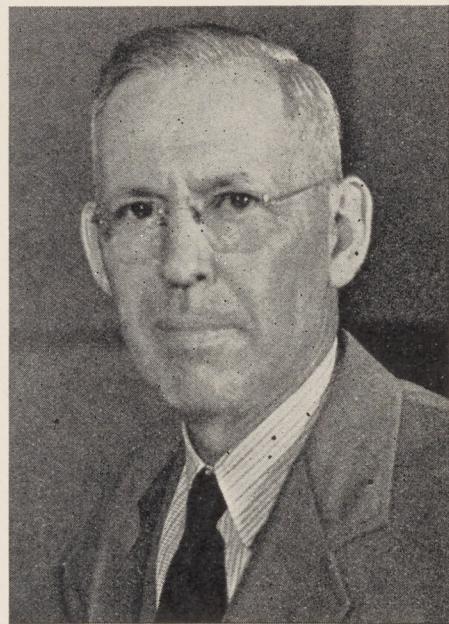
A retaining wall around the new headquarters of the California State Division of Forestry at San Jacinto is being built of native rock taken out of the headings of the San Jacinto tunnel.

* * *

Cathryn Belcher, of the Electrical-Mechanical Division, will leave the District on September 15 to become manager of Cantor's Beauty Salon, Ltd., on Olympic Boulevard in Los Angeles.

* * *

Old Berdoo-ites will be glad to learn that Waldo Ruess, one of the old-time main aqueducts, has returned from China. Waldo left the District in 1934 to go with the DuPont Company in China and was stationed at Shanghai and Hankow until last spring when the current oriental festivities caused that firm to close its offices in China. Waldo had the hair-raising experience of participating (not by choice) in a number of the air raids at Shanghai and Hankow which have been making headlines for the past months. He returned to the United States "round the world" by way of the Suez Canal.



Filling out this trio of Banning personalities is this recent and very excellent likeness of Assistant General Manager J. L. Burkholder.

Construction Notes Along the Aqueduct

"Just about ready for water" is the latest report that comes from the Intake Pumping plant where Chief Electrical Engineer J. M. Gaylord's men are already organizing their work for final testing of that big plant. Physical installation of the three motors for the initial development has been completed, and on September 2 all electrical work on motor No. 3 was finished.

Approximately 300 men are now employed on District force-account crews in the five pumping plants on the installation of the pumps and motors and the great mass of intricate mechanical and electrical work that is necessary in making the plants ready for their job of lifting aqueduct water a total height of 1617 feet over the mountain ranges that lie between the Colorado River and Southern California's coastal basin.

Buildings and appurtenant works at all plants have been completed for some time, and at the end of August the approximate status of completed equipment installation was as follows: Intake, 90%; Gene, 85%; Iron Mountain, 92%; Eagle Mountain, 75%; Hayfield, 40%.

At the western end of the aqueduct project, the principal construction activity is centered on the construction of the Palos Verdes cross-feeder of the distributing system. (See story page 2).

Totaling approximately 18 miles, schedules Nos. 21, 22, and 23 on this feeder are now being constructed by the J. F. Shea Co. Excavation work on schedule 23, at the southern end of the contract, was completed on August 22, and pipe laying was completed on August 25. A total of 1180 steel pipe sections was placed on this schedule which is 34,358 feet in length.

Construction of this schedule was the first work started on this lateral on which work was carried northward from 98th street in Los Angeles. Charles Shea, Jr., is construction superintendent on the construction work at that end of the line which has now progressed into schedule 22.

Crews under Superintendent H. F. "Curly" Rennebohm are also working on schedule 21 on the northern end of the feeder, having started at the junction with the Upper Feeder in Eagle Rock Canyon.

Construction of these and other distributing features is under the supervision of Distribution Engineer R. B. Diemer. H. R. "Ben" Bolton is resident engineer on the open work schedules.

Who's Who On the Aqueduct



Ralph C. Davis



Frank A. Backman



Herbert Gillings

RALPH C. DAVIS

General Foreman, Iron Mt. Pumping Plant, M. W. D.

Born in Auburn, Maine, July 21, 1888 . . . Studied electrical engineering at the University of Maine . . . Has had more than 28 years of experience on heavy construction work, approximately half of which has been on power plant installations . . . Was electrical foreman for Stone & Webster for six years, construction superintendent for Thebo-Starr & Anderson, San Francisco, for three years, and was layout engineer for Lindgren & Swinerton, Los Angeles, for two years. . . First work on the aqueduct was as electrician on the San Jacinto tunnel in 1933. . . Has been general foreman on pump plant construction (Electrical-Mechanical Div.) since June, 1937.

FRANK A. BACKMAN

General Foreman, San Jacinto Tunnel, M. W. D.

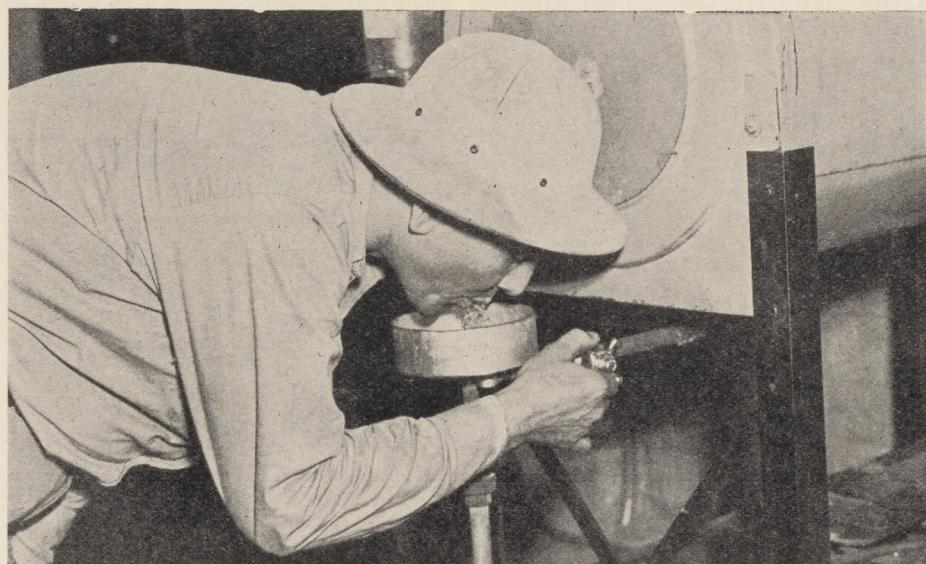
Born in Salt Lake City, Utah, May 24, 1901. . . Studied irrigation engineering at Utah State College, and civil en-

gineering and geology at University of Southern California. . . Was diamond drilling and grouting foreman on the construction of Boulder Dam, and general foreman in charge of concrete construction on the Boulder Dam powerhouse. . . Has been general foreman on the construction of the San Jacinto tunnel since May, 1936.

HERBERT GILLINGS

General Foreman, Hayfield Pumping Plant, M. W. D.

Born in England, June 24, 1902. . . Attended Massachusetts Institute of Technology. . . Was on substation and powerhouse construction for six years with the Southern California Edison Co. . . Was electrical foreman for the Southern Sierras Power Co. on substation construction at Boulder Dam, and was field superintendent for the Six Companies in charge of electrifying the gravel and mixing plants at Boulder Dam. . . Started with the M. W. D. as an electrician in 1933 and has been a general foreman on pump plant construction since December, 1937.



Pete DePace, general foreman at the Intake pumping plant, quenches his thirst with a cool drink of Colorado River water which is now piped directly from the Parker Reservoir to all drinking fountains in the plant.